

What is claimed is:

- 1        1. A system for determining a reference baseline of patient  
2 information for automated remote patient care, comprising:
  - 3            a medical device regularly recording and storing measures sets comprising  
4 individual measures which each relate to patient information by a medical device  
5 adapted to be implanted for an individual patient during an initial time period;
  - 6            a database collecting one or more patient care records, comprising:
    - 7                one or more patient care records which each comprise a plurality  
8 of the collected measures sets;
    - 9                a database module storing the collected measures set into a patient  
10 care record for the individual patient within the database; and
    - 11            a server, comprising:
      - 12                a receiver receiving the collected device measures set from the  
13 medical device adapted to be implanted;
      - 14                an analysis module processing the collected device measures set into a set  
15 of reference measures, each reference measure being representative of at least one  
16 of measured or derived patient information, and storing the reference measures set  
17 into the patient care record as data in a reference baseline indicating an initial  
18 patient status.
- 1        2. A system according to Claim 1, further comprising:
  - 2            a remote client recording a set of quality of life measures during the initial  
3 time period;
  - 4            the database storing the collected quality of life measures set into the  
5 patient care record for the individual patient; and
  - 6            the server receiving the quality of life measures set from the remote client,  
7 and assimilating the collected quality of life measures set into the reference  
8 baseline data stored in the patient care record.
- 1        3. A system according to Claim 1, further comprising:

2                   the medical device adapted to be implanted monitoring the individual  
3                   patient while the individual patient is performing a prescribed set of timed  
4                   physical stressors during the initial time period.

1                  4.        A system according to Claim 1, further comprising:  
2                   a programmer reprogramming at least one of pacing interventions and  
3                   pacing modes of the medical device adapted to be implanted during the initial  
4                   time period; and

5                   the medical device adapted to be implanted monitoring the individual  
6                   patient subsequent to the reprogramming during the initial time period.

1                  5.        A system according to Claim 1, further comprising:  
2                   a feedback recorder recording feedback from the individual patient during  
3                   the initial time period;  
4                   the database storing the recorded feedback into the patient care record for  
5                   the individual patient; and  
6                   the server receiving the recorded feedback from the remote client, and  
7                   assimilating the recorded feedback into the reference baseline data stored in the  
8                   patient care record.

1                  6.        A system according to Claim 5, wherein the feedback recorder  
2                   comprises at least one of an audio recorder, a digital camera, or a video camera.

1                  7.        A system according to Claim 1, further comprising:  
2                   a set of acceptance parameters stored within the database with each  
3                   acceptance parameter corresponding to the same type of patient information to  
4                   which at least one of the reference measures relates;  
5                   the server further comprising:  
6                   an evaluation module analyzing the reference measures set for  
7                   each patient care record against the acceptance parameters set; and  
8                   an acceptance module identifying each patient care record storing a  
9                   reference measures set having at least one reference measure substantially non-  
10                  conforming to the corresponding acceptance parameter.

1           8.       A system according to Claim 1, the application server further  
2 comprising:

3               an analysis module analyzing one or more collected device measures sets  
4 in the patient care record for the individual patient relative to the reference  
5 measures sets in the reference baseline to determine a patient status indicator.

1           9.       A system according to Claim 8, the application server further  
2 comprising:

3               the analysis module analyzing one or more of the collected device  
4 measures sets in the patient care record for the individual patient relative to one or  
5 more other collected device measures sets stored in the database to further  
6 determine the patient status indicator.

1           10.      A system according to Claim 1, wherein each of the set of  
2 reference measures is selected from the group comprising patient activity score,  
3 posture, atrial electrical activity, ventricular electrical activity, cardiovascular  
4 pressures, cardiac output, oxygenation, pulmonary measures, body temperature,  
5 PR interval, QRS measures, QT interval, ST-T wave measures, potassium [K<sup>+</sup>]  
6 level, sodium [Na<sup>+</sup>] level, glucose level, blood urea nitrogen and creatinine,  
7 acidity (pH) level, hematocrit, hormonal levels, cardiac injury chemical tests,  
8 myocardial blood flow, central nervous system injury chemical tests, central  
9 nervous system (CNS) blood flow, and time of day and combinations and  
10 derivatives thereof.

1           11.      A method for determining a reference baseline of patient  
2 information for automated remote patient care, comprising:

3               regularly recording and storing measures sets comprising individual  
4 measures which each relate to patient information by a medical device adapted to  
5 be implanted for an individual patient during an initial time period;  
6               receiving the collected device measures set from the medical device  
7 adapted to be implanted;  
8               collecting one or more patient care records into a database, comprising:

9 organizing one or more patient care records which each comprise a  
10 plurality of the collected measures sets;  
11 storing the collected measures set into a patient care record for the  
12 individual patient within the database; and  
13 processing the collected device measures set into a set of reference  
14 measures, each reference measure being representative of at least one of measured  
15 or derived patient information, and storing the reference measures set into the  
16 patient care record as data in a reference baseline indicating an initial patient  
17 status.

1        12. A method according to Claim 11, further comprising:  
2        receiving a set of quality of life measures recorded by the individual  
3        patient during the initial time period ;  
4        storing the collected quality of life measures set into the patient care  
5        record for the individual patient within the database; and  
6        assimilating the collected quality of life measures set into the reference  
7        baseline data stored in the patient care record.

1           13. A method according to Claim 11, further comprising:  
2           monitoring the individual patient using the medical device adapted to be  
3           implanted while the individual patient is performing a prescribed set of timed  
4           physical stressors during the initial time period.

1           14. A method according to Claim 11, further comprising:  
2           reprogramming at least one of pacing interventions and pacing modes of  
3           the medical device adapted to be implanted during the initial time period; and  
4           monitoring the individual patient using the medical device adapted to be  
5           implanted subsequent to the reprogramming during the initial time period.

1        15. A method according to Claim 11, further comprising:  
2        receiving feedback recorded by the individual patient during the initial  
3        time period which is interfaced to the server;

4           storing the recorded feedback into the patient care record for the  
5 individual patient within the database; and  
6           assimilating the recorded feedback into the reference baseline data stored  
7 in the patient care record.

1           16.     A method according to Claim 15, wherein the feedback comprises  
2     at least one of audio, digitized imagery, or video feedback.

1        17. A method according to Claim 11, further comprising:  
2            defining a set of acceptance parameters with each acceptance parameter  
3            corresponding to the same type of patient information to which at least one of the  
4            reference measures relates:

- 5 analyzing the reference measures set for each patient care record against
- 6 the acceptance parameters set; and
- 7 identifying each patient care record storing a reference measures set
- 8 having at least one reference measure substantially non-conforming to the
- 9 corresponding acceptance parameter.

1           18. A method according to Claim 11, further comprising:  
2           analyzing one or more collected device measures sets in the patient care  
3           record for the individual patient relative to the reference measures sets in the  
4           reference baseline to determine a patient status indicator.

1           19. A method according to Claim 18, further comprising:  
2           analyzing one or more of the collected device measures sets in the patient  
3           care record for the individual patient relative to one or more other collected  
4           device measures sets stored in the database to further determine the patient status  
5           indicator

1        20. A method according to Claim 11, wherein each of the set of  
2 reference measures is selected from the group comprising patient activity score,  
3 posture, atrial electrical activity, ventricular electrical activity, cardiovascular  
4 pressures, cardiac output, oxygenation, pulmonary measures, body temperature,

5 PR interval, QRS measures, QT interval, ST-T wave measures, potassium [K+]  
6 level, sodium [Na+] level, glucose level, blood urea nitrogen and creatinine,  
7 acidity (pH) level, hematocrit, hormonal levels, cardiac injury chemical tests,  
8 myocardial blood flow, central nervous system injury chemical tests, central  
9 nervous system (CNS) blood flow, and time of day and combinations and  
10 derivatives thereof.

1 21. A computer-readable storage medium holding code for  
2 determining a reference baseline of patient information for automated remote  
3 patient care, comprising:

4 code for regularly recording and storing measures sets comprising  
5 individual measures which each relate to patient information by a medical device  
6 adapted to be implanted for an individual patient during an initial time period;

7 code for receiving the collected device measures set from the medical  
8 device adapted to be implanted;

9 code for collecting one or more patient care records into a database,  
10 comprising:

11 code for organizing one or more patient care records which each  
12 comprise a plurality of the collected measures sets;

13 code for storing the collected measures set into a patient care  
14 record for the individual patient within the database; and

15 code for processing the collected device measures set into a set of  
16 reference measures, each reference measure being representative of at least one of  
17 measured or derived patient information, and storing the reference measures set  
18 into the patient care record as data in a reference baseline indicating an initial  
19 patient status.

1 22. A storage medium according to Claim 21, further comprising:

2 code for receiving a set of quality of life measures recorded by the  
3 individual patient during the initial time period;

4 code for storing the collected quality of life measures set into the patient  
5 care record for the individual patient within the database; and

6           code for assimilating the collected quality of life measures set into the  
7   reference baseline data stored in the patient care record.

1           23.    A storage medium according to Claim 21, further comprising:  
2           code for monitoring the individual patient using the medical device  
3           adapted to be implanted while the individual patient is performing a prescribed set  
4           of timed physical stressors during the initial time period.

1           24.    A storage medium according to Claim 21, further comprising:  
2           code for reprogramming at least one of pacing interventions and pacing  
3           modes of the medical device adapted to be implanted during the initial time  
4           period; and  
5           code for monitoring the individual patient using the medical device  
6           adapted to be implanted subsequent to the reprogramming during the initial time  
7           period.

1           25.    A storage medium according to Claim 21, further comprising:  
2           code for receiving feedback recorded by the individual patient during the  
3           initial time period;  
4           code for storing the recorded feedback into the patient care record for the  
5           individual patient within the database; and  
6           code for assimilating the recorded feedback into the reference baseline  
7           data stored in the patient care record.

1           26.    A storage medium according to Claim 21, further comprising:  
2           code for defining a set of acceptance parameters with each acceptance  
3           parameter corresponding to the same type of patient information to which at least  
4           one of the reference measures relates;  
5           code for analyzing the reference measures set for each patient care record  
6           against the acceptance parameters set; and  
7           code for identifying each patient care record storing a reference measures  
8           set having at least one reference measure substantially non-conforming to the  
9           corresponding acceptance parameter.

1        27. A storage medium according to Claim 21, further comprising:  
2            code for analyzing one or more collected device measures sets in the  
3            patient care record for the individual patient relative to the reference measures  
4            sets in the reference baseline to determine a patient status indicator.

1        28. A storage medium according to Claim 21, further comprising:  
2            code for analyzing one or more of the collected device measures sets in  
3            the patient care record for the individual patient relative to one or more other  
4            collected device measures sets stored in the database to further determine the  
5            patient status indicator.

6        29. A system for monitoring a patient status for using a reference  
7            baseline for automated remote patient care, comprising:  
8            a server, comprising:  
9            a processing module processing a set of collected measures regularly  
10          recorded by a medical device adapted to be implanted in an individual patient into  
11          a set of reference measures and storing the reference measures set in a reference  
12          baseline indicating an initial patient status, the collected device measures set  
13          comprising individual measures which each relate to patient information recorded  
14          by the medical device throughout an initial time period, each reference measure  
15          being representative of at least one of measured or derived patient information;  
16          and  
17          an analysis module periodically receiving a set of collected measures from  
18          the medical device, the collected device measures set comprising individual  
19          measures which each relate to patient information recorded by the medical device  
20          subsequent to the initial time period, and comparing one or more of the  
21          subsequently collected device measures sets in the patient care record to the  
22          reference measures set and identifying any such subsequently collected measure  
23          substantially non-conforming to the corresponding reference measure; and

24           a database storing the patient care record, including the subsequently  
25    collected device measures set into the patient care record for the individual  
26    patient.

1           30.    A system according to Claim 29, the application server further  
2    comprising:

3           an analysis module analyzing one or more of the subsequently collected  
4    device measures sets in the patient care record for the individual patient relative to  
5    one or more other subsequently collected device measures sets stored in the  
6    database to determine a patient status indicator.

1           31.    A system according to Claim 29, the application server further  
2    comprising:

3           a feedback module providing automated feedback based on the patient  
4    status indicator to the individual patient over a feedback communications link  
5    configured between the server and a feedback client.

1           32.    A system according to Claim 29, further comprising:

2           the server receiving initially feedback recorded by the individual patient  
3    during the initial time period and receiving feedback recorded by the individual  
4    patient subsequent to the initial time period;

5           the database storing the initially recorded feedback as reference feedback  
6    into the patient care record for the individual patient within the database and  
7    storing the subsequently recorded feedback into the patient care record for the  
8    individual patient; and

9           the analyzing module comparing the subsequently recorded feedback to  
10   the reference feedback in the patient care record and identifying any such  
11   subsequently recorded feedback substantially non-conforming to the reference  
12   feedback.

1           33.    A system according to Claim 32, wherein the patient feedback  
2    comprises at least one of audio, digitized imagery, or video feedback.

1           34. A system according to Claim 29, further comprising:  
2           the application server further comprising a reevaluation module processing  
3           a new set of collected measures recorded by a medical device adapted to be  
4           implanted in an individual patient into a new set of reference measures, the new  
5           collected device measures set comprising individual measures which each relate  
6           to patient information recorded by the medical device adapted to be implanted  
7           subsequent to the initial time period, each new reference measure being  
8           representative of at least one of measured or derived patient information; and  
9           the database storing the new reference measures set into the patient care  
10          record as a new reference baseline indicating a revised patient status.

1           35. A system according to Claim 29, further comprising:  
2           the database storing an initial set of quality of life measures recorded by  
3           the individual patient during the initial time period into the patient care record  
4           within the database and storing a subsequently collected quality of life measures  
5           set received by the server into the patient care record for the individual patient;  
6           the application server assimilating the initial quality of life measures set  
7           into the reference baseline data stored in the patient care record; and  
8           the application server comparing one or more of the subsequently  
9           collected quality of life measures to the initial quality of life measures in the  
10          reference measures set and identifying any such subsequently collected quality of  
11          life measure substantially non-conforming to the corresponding quality of life  
12          reference measure.

1           36. A system according to Claim 29, the application server further  
2          comprising:  
3           a monitoring module monitoring the individual patient using the medical  
4           device adapted to be implanted while the individual patient is performing a  
5           prescribed set of timed physical stressors during the initial time period.

1           37. A system according to Claim 36, wherein the prescribed set of  
2          activities are representative of substantially normal activity, further comprising:

3                   the server determining relative abnormal activity response based on any  
4   subsequently collected measure identified as being substantially non-conforming  
5   to the corresponding reference measure.

1                   38.    A system according to Claim 36, wherein the prescribed set of  
2   activities are representative of substantially normal exercise, further comprising:  
3                   the server determining relative abnormal exercise response based on any  
4   subsequently collected measure identified as being substantially non-conforming  
5   to the corresponding reference measure.

1                   39.    A system according to Claim 29, wherein the reference measures  
2   set comprises at least one of the following: patient activity score, posture, atrial  
3   electrical activity, ventricular electrical activity, cardiovascular pressures, cardiac  
4   output, oxygenation, pulmonary measures, body temperature, PR interval, QRS  
5   measures, QT interval, ST-T wave measures, potassium [K+] level, sodium [Na+]  
6   level, glucose level, blood urea nitrogen and creatinine, acidity (pH) level,  
7   hematocrit, hormonal levels, cardiac injury chemical tests, myocardial blood flow,  
8   central nervous system injury chemical tests, central nervous system (CNS) blood  
9   flow, and time of day and combinations and derivatives thereof.

1                   40.    A method for monitoring a patient status for using a reference  
2   baseline for automated remote patient care, comprising:  
3                   processing a set of collected measures regularly recorded by a medical  
4   device adapted to be implanted in an individual patient into a set of reference  
5   measures and storing the reference measures set in a reference baseline indicating  
6   an initial patient status, the collected device measures set comprising individual  
7   measures which each relate to patient information recorded by the medical device  
8   throughout an initial time period, each reference measure being representative of  
9   at least one of measured or derived patient information;  
10                  periodically receiving a set of collected measures from the medical device,  
11   the collected device measures set comprising individual measures which each

12 relate to patient information recorded by the medical device subsequent to the  
13 initial time period;  
14 comparing one or more of the subsequently collected device measures sets  
15 in the patient care record to the reference measures set and identifying any such  
16 subsequently collected measure substantially non-conforming to the  
17 corresponding reference measure; and  
18 storing the patient care record in a database, including the subsequently  
19 collected device measures set into the patient care record for the individual  
20 patient.

1 41. A method according to Claim 40, further comprising:  
2 analyzing one or more of the subsequently collected device measures sets  
3 in the patient care record for the individual patient relative to one or more other  
4 subsequently collected device measures sets stored in the database to determine a  
5 patient status indicator.

1 42. A method according to Claim 40, further comprising:  
2 providing automated feedback based on the patient status indicator to the  
3 individual patient over a feedback communications link configured between a  
4 server and a feedback client.

1 43. A method according to Claim 40, further comprising:  
2 receiving feedback recorded by the individual patient during the initial  
3 time period and storing the recorded feedback as reference feedback into the  
4 patient care record for the individual patient within the database;  
5 receiving feedback recorded by the individual patient subsequent to the  
6 initial time period;  
7 storing the subsequently recorded feedback into the patient care record for  
8 the individual patient within the database; and  
9 comparing the subsequently recorded feedback to the reference feedback  
10 in the patient care record and identifying any such subsequently recorded  
11 feedback substantially non-conforming to the reference feedback.

1           44.    A method according to Claim 43, wherein the patient feedback  
2   comprises at least one of audio, digitized imagery, or video feedback.

1           45.    A method according to Claim 40, further comprising:  
2           processing a new set of collected measures recorded by the medical device  
3   into a new set of reference measures and storing the new reference measures set  
4   into the patient care record as a new reference baseline indicating a revised patient  
5   status, the new collected device measures set comprising individual measures  
6   which each relate to patient information recorded by the medical device adapted  
7   to be implanted subsequent to the initial time period, each new reference measure  
8   being representative of at least one of measured or derived patient information.

1           46.    A method according to Claim 40, further comprising:  
2           storing a set of quality of life measures recorded by the individual patient  
3   during the initial time period into the patient care record and assimilating the  
4   quality of life measures into the reference baseline data stored in the patient care  
5   record;  
6           receiving a quality of life measures set recorded by the individual patient  
7   subsequent to the initial time period;  
8           storing the subsequently collected quality of life measures set into the  
9   patient care record for the individual patient within the database; and  
10          comparing one or more of the subsequently collected quality of life  
11   measures to the quality of life measures in the reference measures set and  
12   identifying any such subsequently collected quality of life measure substantially  
13   non-conforming to the corresponding quality of life reference measure.

1           47.    A method according to Claim 40, further comprising:  
2           monitoring the individual patient using the medical device adapted to be  
3   implanted while the individual patient is performing a prescribed set of timed  
4   physical stressors during the initial time period.

1        48.    A method according to Claim 47, wherein the prescribed set of  
2    activities are representative of substantially normal activity, further comprising:  
3                determining relative abnormal activity response based on any  
4    subsequently collected measure identified as being substantially non-conforming  
5    to the corresponding reference measure.

1        49.    A method according to Claim 47, wherein the prescribed set of  
2    activities are representative of substantially normal exercise, further comprising:  
3                determining relative abnormal exercise response based on any  
4    subsequently collected measure identified as being substantially non-conforming  
5    to the corresponding reference measure.

1        50.    A method according to Claim 40, wherein the reference measures  
2    set comprises at least one of the following: patient activity score, posture, atrial  
3    electrical activity, ventricular electrical activity, cardiovascular pressures, cardiac  
4    output, oxygenation, pulmonary measures, body temperature, PR interval, QRS  
5    measures, QT interval, ST-T wave measures, potassium [K+] level, sodium [Na+]  
6    level, glucose level, blood urea nitrogen and creatinine, acidity (pH) level,  
7    hematocrit, hormonal levels, cardiac injury chemical tests, myocardial blood flow,  
8    central nervous system injury chemical tests, central nervous system (CNS) blood  
9    flow, and time of day and combinations and derivatives thereof.

1        51.    A computer-readable storage medium holding code for monitoring  
2    a patient status for using a reference baseline for automated remote patient care,  
3    comprising:

4                code for processing a set of collected measures regularly recorded by a  
5    medical device adapted to be implanted in an individual patient into a set of  
6    reference measures and storing the reference measures set in a reference baseline  
7    indicating an initial patient status, the collected device measures set comprising  
8    individual measures which each relate to patient information recorded by the  
9    medical device throughout an initial time period, each reference measure being  
10   representative of at least one of measured or derived patient information;

11           code for periodically receiving a set of collected measures from the  
12    medical device, the collected device measures set comprising individual measures  
13    which each relate to patient information recorded by the medical device  
14    subsequent to the initial time period;

15           code for comparing one or more of the subsequently collected device  
16    measures sets in the patient care record to the reference measures set and  
17    identifying any such subsequently collected measure substantially non-  
18    conforming to the corresponding reference measure; and

19           code for storing the patient care record in a database, including the  
20    subsequently collected device measures set into the patient care record for the  
21    individual patient.

1           52.    A storage medium according to Claim 51, further comprising:  
2           code for analyzing one or more of the subsequently collected device  
3    measures sets in the patient care record for the individual patient relative to one or  
4    more other subsequently collected device measures sets stored in the database to  
5    determine a patient status indicator.

1           53.    A storage medium according to Claim 51, further comprising:  
2           code for providing automated feedback based on the patient status  
3    indicator to the individual patient over a feedback communications link  
4    configured between the server and a feedback client.

1           54.    A storage medium according to Claim 51, further comprising:  
2           code for storing feedback recorded by the individual patient during the  
3    initial time period which is interfaced to the server and storing the recorded  
4    feedback as reference feedback into the patient care record for the individual  
5    patient within the database;

6           code for receiving feedback recorded by the individual patient subsequent  
7    to the initial time period which is interfaced to the server;

8           code for storing the subsequently recorded feedback into the patient care  
9    record for the individual patient within the database; and

10           code for comparing the subsequently recorded feedback to the reference  
11    feedback in the patient care record and identifying any such subsequently  
12    recorded feedback substantially non-conforming to the reference feedback.

1           55.    A storage medium according to Claim 51, further comprising:  
2           code for processing a new set of collected measures recorded by a medical  
3    device adapted to be implanted in an individual patient into a new set of reference  
4    measures and storing the new reference measures set into the patient care record  
5    as a new reference baseline indicating a revised patient status, the new collected  
6    device measures set comprising individual measures which each relate to patient  
7    information recorded by the medical device adapted to be implanted subsequent  
8    to the initial time period, each new reference measure being representative of at  
9    least one of measured or derived patient information.

1           56.    A storage medium according to Claim 51, further comprising:  
2           code for storing a set of quality of life measures recorded by the individual  
3    patient during the initial time period into the patient care record and assimilating  
4    the quality of life measures into the reference baseline data stored in the patient  
5    care record;

6           code for receiving a quality of life measures set recorded by the individual  
7    patient subsequent to the initial time period which is interfaced to the server;

8           code for storing the subsequently collected quality of life measures set into  
9    the patient care record for the individual patient within the database; and

10          code for comparing one or more of the subsequently collected quality of  
11    life measures to the quality of life measures in the reference measures set and  
12    identifying any such subsequently collected quality of life measure substantially  
13    non-conforming to the corresponding quality of life reference measure.

1           57.    A storage medium according to Claim 51, further comprising:  
2           code for monitoring the individual patient using the medical device while  
3    the individual patient is performing a prescribed set of timed physical stressors  
4    during the initial time period.

1           58.    A storage medium according to Claim 57, wherein the prescribed  
2 set of activities are representative of substantially normal activity, further  
3 comprising:

4           code for determining relative abnormal activity response based on any  
5 subsequently collected measure identified as being substantially non-conforming  
6 to the corresponding reference measure.

1           59.    A storage medium according to Claim 57, wherein the prescribed  
2 set of activities are representative of substantially normal exercise, further  
3 comprising:

4           code for determining relative abnormal exercise response based on any  
5 subsequently collected measure identified as being substantially non-conforming  
6 to the corresponding reference measure.